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Hybridisation between Common Buzzard *Buteo buteo* and Rough-legged Buzzard *B. lagopus* in Norway

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A mixed pair (male) Common Buzzard *Buteo buteo* and (female) Rough-legged Buzzard *B. lagopus* successfully fledged three young near Trondheim in the county of Sør-Trøndelag, central Norway, in summer 2005. *B. lagopus* is a common breeder in this area in years with high numbers of small rodents, and occurs through much of Norway, usually in mountains and higher elevation forests, but sometimes also in lower forested areas. *B. buteo* has not previously been found nesting in Sør-Trøndelag county, although some previous observations are suggestive of breeding, and there is a confirmed nesting in Nord-Trøndelag county. In Norway, the species occurs in lowlands of the south and south-east (Gjershaug *et al.* 1994).

There are very few records of mixed pairs of *Buteo* species in the wild (Gray 1958, Panov 1998, Clark & Witt in press). An escaped Red-tailed Hawk *B. jamaicensis* mated with a *B. buteo* and produced fertile eggs in Scotland in 1969 (Murray 1970), and a mixed pair, involving a presumed escaped Red-backed Hawk *B. polyosoma* and a Swainson's Hawk *B. swainsoni* bred for more than eight years in Colorado, USA (Allen 1988, Wheeler 1988). Hybridisation between *B. lagopus* and Swainson's Hawk was documented in Louisiana, USA, based on DNA analysis of a specimen (Clark & Witt in press), a probable hybrid between the same two species was photographed in Texas, and hybrids between *B. lagopus* and *B. jamaicensis* described from Colorado and California (Clark *et al.* in prep.). Mixed pairing of Red-shouldered Hawk *B. lineatus* and Grey Hawk *B. nitidus* has been reported from Texas (Lasley 1989). Hybridisation between Upland Buzzard *B. hemilasius* and Long-legged Buzzard *B. rufinus* is known from Central Asia

(Pfander & Schmigalew 2001). Gray (1958) listed alleged hybrids between *B. lagopus* and *B. buteo*, but regarded them as conjectural. Here we present the first proof of such hybridisation.

Study area and methods

The study area, near Trondheim, Sør-Trøndelag, central Norway, lies at *c.*200 m and is dominated by old spruce forest within a mosaic of pine forest on cliffs, open bogs, clear-fellings and small lakes. The nest was on a ledge of a small cliff, a typical location for *B. lagopus*, and was found by OAF on 4 June. When visited on 15 July, the three juveniles, now *c.*40 days old, had left the nest but were still nearby. Photographs were taken with a Nikon Coolpix 4500 digital camera through a Swarovski telescope. Tape-recordings of the begging calls of the juveniles were made with a Sony tape-recorder (TC-D5 PRO) and Telinga parabolic microphone (PRO III). For comparison, tape-recordings of juvenile calls of *Buteo buteo* of the same age were obtained from the British Library Sound Archive (London, UK). Sonograms were obtained using a KAY Elemetrics DSP Sonagraph model 5500. The pitch (highest frequency) was measured to the nearest 0.01 kHz and note length to the nearest 0.01 second. The calls of the hybrids were compared with similar calls of juvenile *B. lagopus* and *B. buteo* of the same age (*c.*40 days).

Results

Identification of the parents

The adults were identified as a typical female *B. lagopus* with a white tail, broad subterminal band and one additional dark bar inside it (Fig. 1), and a typical brown male of *B. buteo* with bare yellow tarsi (Fig. 2). Sexing of the *B. buteo* was based on the other bird being female. Sexing based on plumage is impossible in *B. buteo* (Forsman 1999).

Description of the hybrid juveniles

The hybrids had intermediate characters. They were very similar, except that the amount of white on some of the tail-feathers varied slightly. One juvenile had one partially white tail-feather (Fig. 3), whilst another had two partly white tail-feathers. The dark belly (Fig. 4) resembled *B. lagopus*. The partially feathered tarsi (Fig. 5) were intermediate between the two species, except that juvenile *B. lagopus* has only sparse dark markings on the tarsal feathers (Fig. 6). The brown tail with several dark bars (Fig. 7) and dark brown mantle and upperwing-coverts (Fig. 8) resembled *B. buteo*. The underwing-coverts had more dark spots than in juvenile *B. lagopus*. The hybrids lacked the pale basal area on the upper primaries and median coverts typical of juvenile *B. lagopus*, and were darker headed than juvenile *B. lagopus*.

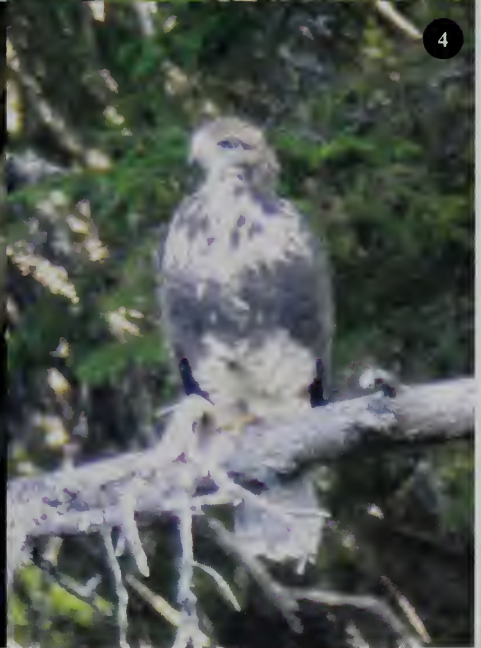
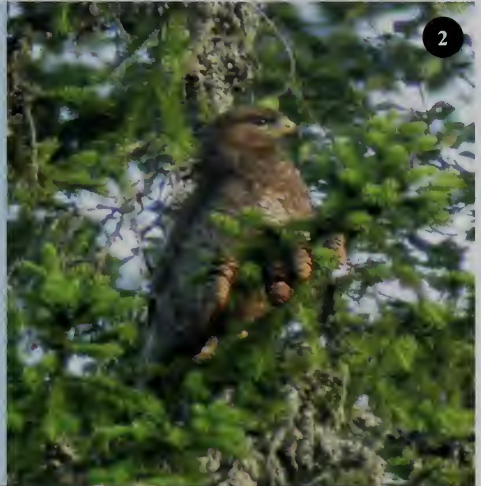
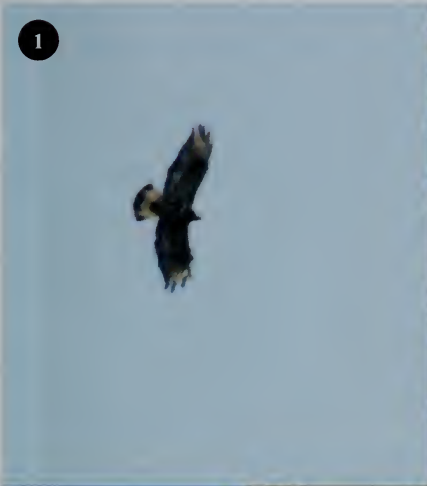


Figure 1. The female *Buteo lagopus* (Jan Ove Gjershaug)

Figure 2. The male *Buteo buteo* (Jan Ove Gjershaug)

Figure 3. Hybrid juvenile with one partially white tail-feather (Jan Ove Gjershaug)

Figure 4. The hybrids had dark bellies similar to juvenile *B. lagopus* (Jan Ove Gjershaug)



Figure 5. The legs of the hybrids were partially feathered, with heavy dark markings (Jan Ove Gjershaug)
Figure 6. The legs of juvenile *B. lagopus* have sparse dark markings (Jan Ove Gjershaug)
Figure 7. The tail-feathers of the hybrids had several dark bands similar to juvenile *B. buteo* (Jan Ove Gjershaug)
Figure 8. The hybrids lacked the broad pale-fringed median covert patch typical of juvenile *B. lagopus* (Jan Ove Gjershaug)

TABLE 1

Frequency, note length and distribution of identified call types in 40-day-old juveniles of *Buteo lagopus* × *B. buteo*, *Buteo lagopus* and *Buteo buteo*. *n* = number of analysed sonograms.

		<i>Buteo lagopus</i> × <i>B. buteo</i>	<i>Buteo lagopus</i>	<i>Buteo buteo</i>
Frequency (kHz)	Mean±SD	3.17±0.17	2.76±0.22	2.40±0.23
	Range	2.68–3.28	2.28–3.12	2.16–2.68
	<i>n</i>	12	20	4
Note length (s)	Mean±SD	0.83±0.15	1.05±0.11	0.73±0.21
	Range	0.70–1.14	0.86–1.29	0.42–0.89
	<i>n</i>	12	19	4
Distribution of call type (%)	I	34	54	
	II	54	17	
	III	12	29	
	<i>n</i>	100	100	

The food-begging calls

The begging calls of the hybrids were very similar to those of Rough-legged Buzzard (Fig. 9, Table 1). On the basis of the spectrograph, the calls were assigned to one of two types: unmodulated whistles (I) and double whistles (II). The latter were characterised by a sudden frequency rise at the start and a corresponding drop at the end. Most calls were somewhat higher pitched and rather shorter than those uttered by juvenile *B. lagopus*. In addition, the juveniles had calls that were incomplete variants between the two types, which were pooled into a third type (III). The recorded calls of juvenile Common Buzzard are all of the same type and bear no resemblance to those of the hybrids (Fig. 9).

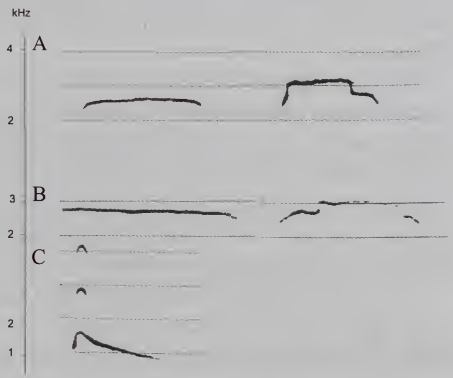


Figure 9. Sonograms of the calls of the juvenile hybrids between *Buteo lagopus* and *B. buteo* (A), and for comparison juvenile *B. lagopus* (B) and juvenile *B. buteo* (C). The notes on the left are of type I, those on the right of type II for the hybrids and *Buteo lagopus*.

Discussion

Buteo buteo and *B. lagopus* are not close relatives (Riesing *et al.* 2003, Kruckenhauser *et al.* 2004) and hybridisation between them has, to our knowledge, never been reported. Their ranges overlap only in Fennoscandia (Cramp 1980,

Ferguson-Lees & Christie 2001) and, in the main, they use different breeding habitats. *B. lagopus* prefers open tundra and mountains, penetrating the coniferous taiga zone. In Norway, it now also breeds near clear-fellings in coniferous forest and appears to have increased in lowland areas, probably due to such habitat change (Gjershaug et al. 1994). *B. buteo* prefers predominantly deciduous forests, but also breeds in pure coniferous stands close to open areas such as clear-fells, bogs, meadows and pastures. Possibly changes in forestry practice, with more clear-fellings since the 1960s, have brought the two species into closer contact. *B. lagopus* is the larger of the two and probably dominant, although there is probably little competition for nest sites, as *B. lagopus* usually nests on cliffs and *B. buteo* in trees. In Vestfold county, southern Norway, *B. lagopus* usually nests above 350 m and *B. buteo* only below that (Steen 1993).

Normally, reproductive isolation mechanisms should prevent interbreeding between these two species. One such mechanism is probably their different vocalisations (Cramp & Simmons 1980). A possible explanation for the present case is that the female *B. lagopus* had previously occupied the nest in the breeding cliff and had been unsuccessful in acquiring a mate due to a shortage of unpaired males, leading the female to accept the male *B. buteo*. Males are typically less 'choosy' in mate selection, and a *B. buteo* would have difficulty finding a conspecific mate in this area.

Most plumage characters of the juveniles are intermediate between *B. lagopus* and *B. buteo*, but the heavy dark markings on the tarsus differ strikingly from both parent species, as juvenile *B. lagopus* has only sparse dark markings on the tarsus and *B. buteo* a bare tarsus. The same is described for the hybrid *B. lagopus* x *B. swainsoni* by Clark & Witt (in press), who explain the dark-pigmented tarsus of their hybrid specimen as a possibly transgressive trait, caused by complementary gene action, overdominance or epistasis.

The calls of the juveniles were most similar to those of juvenile *B. lagopus* at the same age. They had very similar notes, but the distribution of the three categories differed. The calls of juvenile *B. buteo* are different, so we can conclude that the calls of the juveniles are not intermediate between the two species. In most non-passerine hybrids calls are intermediate between those of the parents (Payne 1986). For such comparisons to be meaningful, it is essential to sample birds of the same age. The vocalisation of *B. buteo* changes greatly up to 40 days (Glutz von Blotzheim et al. 1989).

Using molecular techniques it should be possible to test for any introgression of genes from one species into the population of the other in the area of overlap. Clark & Witt (in press) reidentified a museum specimen, initially identified as *B. lagopus*, as a *B. lagopus* x *B. swainsoni* using DNA, thereby documenting the first confirmed hybrid specimen in *Buteo*.

There are very few records of mixed pairs of other raptors in the wild (Gray 1958, Newton 1979, Panov 1998). Hybridisation between *Buteo buteo* and Black Kite *Milvus migrans* is known from Italy (Corso & Forsman 1997, Corso & Gildi

1998), Red Kite *Milvus milvus* × *M. migrans* in Germany and Sweden (Wobus & Creutz 1970, Sylvén 1977), Montagu's Harrier *Circus pygargus* × Pallid Harrier *C. macrourus* in Finland (Forsman 1993, 1995), Eastern Marsh Harrier *C. spilonotus* × Western Marsh Harrier *C. aeruginosus* in Siberia (Fefelov 2001) and Grey Goshawk *Accipiter novaehollandiae* × Brown Goshawk *A. fasciatus* in Australia (Cupper 1976, Olsen & Olsen 1985). A hybrid Shikra *Accipiter badius* × Levant Sparrowhawk *A. brevipes* has been reported in Israel (Yosef *et al.* 2001). Hybridisation between Greater Spotted Eagle *Aquila clanga* and Lesser Spotted Eagle *A. pomarina* is known in Estonia, Latvia, Germany, Poland and Belarus (Lõhmus & Väli 2001, Dombrovski 2002, Helbig *et al.* 2005). A possible hybrid Rüppell's Vulture *Gyps rueppelli* × Cape Vulture *G. coprotheres* was observed in Botswana (Borello 2001), and a female–female pairing between a Peregrine Falcon *Falco peregrinus* and Gyrfalcon *F. rusticolus* was recorded in two successive years in Norway (Gjershaug *et al.* 1998).

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